

HOT 300: Chief Scientist Report

Chief Scientist: Tara M. Clemente

R/V *Kilo Moana*

February 24-28, 2018

Cruise ID: **KM18-05**

Departed: February 24, 2018 at 0950 (HST)

Returned: February 28, 2018 at 0806 (HST)

Vessel: **R/V *Kilo Moana***

Master of the Vessel: Greg Steele

OTG Marine Technicians: Trevor Young and Julianna Diehl

1. SCIENTIFIC OBJECTIVES

The objective of the cruise is to maintain a collection of hydrographic and biogeochemical data at the Hawaii Ocean Time-series (HOT) stations. Three stations will be occupied and during the cruise along with the recovery of the deep moored traps, events will occur in the following order:

- 1) Station 1, referred to as Station Kahe, is located at 21° 20.6'N, 158° 16.4'W and will be occupied on February 24th for about 2 hours.
- 2) Station 2, referred to as Station ALOHA, is defined as a circle with a 6 nautical mile radius centered at 22° 45'N, 158°W. This is the main HOT station and will be occupied February 24th – 27th.
- 3) Station 52, the site of WHOTS-14 Mooring (anchor position 22° 40.01'N 157° 57.09'W) will be occupied on for about one hour on February 27th.
- 4) Deep trap recovery (anchor position at 22° 51.971'N, 157° 53.167'W). Recovery of the sediment trap is expected to take approximately 3 hours, with return to the surface expected to take an hour on February 27th.

NOTE: No operations at Station 6, Kaena, due to time requirements for the recovery of the deep sediment trap.

Upon arrival to Station Kahe a ~1300 lb. weight-test cast to 500 m, one CTD cast to 1000 m, one hand held net tow for the Caron lab and a Hyperpro cast were to be conducted on the afternoon of February 24th. The single CTD cast was to be conducted to collect continuous profiles of various physical and chemical parameters. Water samples were to be collected at discrete depths for biogeochemical measurements. After these operations were satisfactorily completed, the ship was to proceed to Station ALOHA.

Upon arrival to Station ALOHA, the WireWalker was to be deployed followed by the free-drifting sediment trap array. These two arrays were to stay in the water for about 54 hours. This was to be followed by a 1000 m CTD cast for preparation of the Primary Productivity Array. This cast was to be followed by the deployment of the free-drifting Primary Productivity Array to incubate *in situ* for 12 hours. A full-depth (~4740 m) CTD cast was to be conducted after the deployment of the Primary Production Array centered over Station ALOHA, followed by 1000 m CTD casts at strict 3 hour intervals for at least 36 hours for continuous and discrete data collection, ending with another full-depth CTD cast at 2300 on February 26th.

The lowered-ADCP was to collect current measurements on down- and up-cast. The LADCP, operating in single ping at 4 Hz, was to record measurements internally and data was to be downloaded after each cast via RS422 connection.

The free-drifting Gas array was to be deployed for 24 hours for incubation experiments on February 26th.

An Automated Trace Element (ATE) sampler was to be deployed to a depth of 10 m on February 26th.

A plankton net was to be towed three times between 1000-1400, and three times between 2200-0200 for 30 minute intervals on February 25th and 26th at Station ALOHA.

A plankton net for the Caron Lab was to be towed four times a day for 15-30 minute intervals on February 25th and 26th at Station ALOHA.

The Hyperpro was to be deployed for a half-hour period near ~1400 on February 24th, 25th, and 27th.

An optics package including a package consisting of a SeaBird Seacat with temperature, conductivity, fluorometer and pressure sensors, and a LISST particle size and distribution analyzer was to be used to profile the upper 200 m at Station ALOHA in the early morning on February 27th.

After the optics package and 36 hour burst period of CTD work at Station ALOHA was accomplished, the ship was to transit to recover the Gas array, the WireWalker and the Sediment Trap array on the morning of February 27th.

After recovering the arrays, , the ship was to transit to Station 52 to conduct a one-hour 200 m CTD yo-yo cast. The ship was to remain 0.25 nm, downwind and down current from Station 52, after completion of the CTD yo-yo to gather one hour of shipboard ADCP for comparison to WHOTS-14 ADCP data. Once operations at Station 52 were complete, the ship was to re-position within Station ALOHA to conduct a Hyperpro cast.

Once operations at Station ALOHA were complete, the ship was to transit to the location of the deep sediment trap anchor at 22°51.971' N, 157°53.167' W. Recovery of the sediment trap was expected to take approximately 3 hours, with return to the surface expected to take an hour.

After deep sediment trap recovery operations were complete, the ship was to transit back to Honolulu Harbor, Pier 35.

The following instruments were to collect data throughout the cruise: shipboard ADCP, thermosalinograph, underway fluorometer, transmissometer, the meteorological package.

2. SCIENCE PERSONNEL

Participant	Title	Affiliation	Citizenship
Karin Bjorkman	Scientist	UH	Sweden
Tim Burrell	Research Associate	UH/SCOPE	New Zealand
Marian Carlson	Scientist	Simons Foundation	USA
Tara Clemente – Chief Scientist	Research Associate	UH/SCOPE	USA
Sara Ferron- Smith	Scientist	UH/SCOPE	USA
Carolina Funkey	Research Associate	UH	USA
Eric Grabowski	Research Associate	UH	USA
Sarah Hu	PhD Candidate	USC/SCOPE	USA
David Karl	Scientist	UH/CMORE/SCOPE	USA
Andrew King	Research Associate	UH	USA
Kelsey Maloney	Undergraduate Student	UH	USA
Lisa Mesrop	Research Technician	USC/SCOPE	USA
William Miller	Scientist	UG	USA
Svetlana Natarov	Research Assistant	UH	USA
Kellen Rosburg	Research Associate	UH	USA

Chris Sabine	Scientist	UH	USA
Dan Sadler	Research Associate	UH	USA
Eric Shimabukuro	Research Associate	UH/SCOPE	USA
Jefrey Snyder	Marine Technician	UH	USA
Ryan Tabata	Research Associate	UH/SCOPE	USA
Avery Tatters	Postdoctoral Scholar	USC/SCOPE	USA
Carleigh Volbrecht	Volunteer	UH	USA
Blake Watkins	Marine Engineer	UH	USA
Angelicque White	Scientist	OSU/SCOPE	USA
Chris Winn	Scientist	HPU	USA
Julianna Diehl	Marine Technician	OTG	USA
Trevor Young	Marine Technician	OTG	USA

3. GENERAL SUMMARY

Operations during the cruise were conducted with modifications to the schedule due to weather. Departure from Pier 35 was delayed by one hour due to Harbor traffic. Operations at Station Kahe were completed late, but successfully with the exception of the HyperPro

We experienced connectivity issues with the HyperPro at Station Kahe. The data connection appeared intermittent, due to a faulty connector and when the connectivity cable was touched the power would turn on and off. The HyperPro was just returned from being repaired at Satlantic with a new connector to address this same issue, but it now appears to be a faulty connector on the cable. OTG re-splice the connector attached to the HyperPro cable and we tried to redeploy the HyperPro, but sadly experienced the same issues. The HyperPro was deemed unfixable at sea and will be repaired ashore.

Winds from the ESE at 20-25 kts and 8-10 ft seas were present during transit to Station ALOHA after passing Kaena Point. We arrived at Station ALOHA 1.5 hours later than scheduled (0134 on February 25th).

Weather predictions for Station ALOHA the week of February 24th – 28th were less than favorable, with both the high winds (+25 kt) and high swell (10-15 ft) building by late Monday evening (February 26th) into early Tuesday morning, February 27th.

Upon arriving at Station ALOHA, it was decided not to deploy the WireWalker and Sediment Traps as the weather conditions were 25kts with 8-10ft seas, and forecasted to increase to 30kts with 10-15ft seas by February 27th, their scheduled recovery day. We successfully conducted a CTD cast for the primary production in situ incubation array and successfully deployed the Primary Production Array. The deep cast was conducted successfully and we began the 36-hour CTD period on schedule.

The Primary Production array was recovered successfully on the evening of February 25th under rough conditions. The gas array deployment was cancelled on the morning of February 26th, due to current conditions and the predicted increase in winds and seas on February 27th, their scheduled recovery day.

As predicted the winds and seas at Station ALOHA increased late Monday evening (February 26th) into the early hours of Tuesday (February 27th) causing the Captain to abort the deep CTD cast at ~600m for safety reasons. The scheduled net tows and optics cast were also cancelled.

At daybreak on Tuesday, February 27th we re-assessed the weather conditions for safety and successfully conducted a YoYo CTD cast at Station 52; WHOTS-14 buoy.

Due to weather conditions HOT-300's schedule was amended as follows:

- Deployment of the WireWalker, Sunday, February 25th 0000, was cancelled.
- Deployment of the sediment trap array, Sunday, February 25th 0100, was cancelled.
- Deployment of the Gas Array, Monday, February 26th, was cancelled.
- Two night time net tows, Monday, February 26th, were cancelled.
- S2C16, was aborted at ~600m, Tuesday, February 27th, under the Captains command, due to weather.
- Deployment of the Optics package, Tuesday, February 27th, was cancelled.
- S6C1, Tuesday, February 27th was cancelled.

One 1000 m CTD cast was completed at Station Kahe. One 200 m CTD, one near bottom CTD casts and twelve 1000 m CTD casts were conducted at Station ALOHA. One 200 m yo-yo CTD cast was completed near the WHOTS mooring (Station 52) with five cycles completed.

Four net tows for the core HOT zooplankton collection were completed successfully; one during the day, and three during the night.

The ATE was conducted successfully on February 26th.

The ADCP, underway fluorometer, thermosalinograph, transmissometer and the ship's meteorological suite ran without interruption during the cruise.

Winds during the cruise were mostly from the ESE with speeds of 20-30 kts. The seas were 8-12 ft.

We arrived at Pier 35 for off-loading on February 28th, at 0806 (HST).

The following operations were cancelled or delayed due problems with equipment:

1. HyperPro casts were cancelled after experiencing connectivity issues with the instrument.

4. R/V *Kilo Moana* OFFICERS AND CREW, TECHNICAL SUPPORT

The R/V *Kilo Moana* continues to maintain very good ship support for our work. Captain Steele and the ship's crew showed flexibility, enthusiasm, concern, and dedication to our scientific mission.

Technical support during this cruise was very good. OTG personnel were available to assist in our work during the cruise.

5. DAILY REPORT OF ACTIVITIES (HST)

February 24, 2018

0950 Depart Pier 35
1030 Safety Briefing
1045 Science Meeting
1055 Fire and Abandon Ship Drills
1115 Secured from Drills
1240 Arrive Station Kahe
1249 Weight cast to 500m
1322 End of weight cast
1330 Hyperpro; connectivity issues- No casts conducted
1350 Start Net Tow (Caron)

1409 End Net Tow (Caron)
1418 S1C1 1000m CTD cast
1558 S1C1 End
1601 Transit to Station ALOHA

February 25, 2018

0134 Arrive at Station ALOHA, 2nm west of center
0141 S2C1 200m CTD cast
0245 S2C1 End
0410 Start Primary Production array deployment, 2nm west of center
0430 Primary Production array released: 22°44.98 N, 158°02.21 W
0432 Transit to Station ALOHA, Center
0500 Arrive at Station ALOHA, Center
0508 Start Net Tow (Caron)
0542 End Net Tow (Caron)
0552 S2C2 near bottom CTD
0747 S2C2 bottom depth 4805db, 8m off bottom
1005 S2C2 End
1020 Start Net Tow (Caron)
1044 End Net Tow (Caron)
1133 S2C3 1000m CTD
1259 S2C3 End
1310 Net tow
1345 Net tow end
1357 Start HyperPro
1359 Aborted HyperPro cast due to connectivity issues
1410 S2C4 1000m CTD
1532 S2C4 End
1535 Transit to pump tanks
1651 Start Net Tow (Caron)
1709 End Net Tow (Caron)
1713 S2C5 1000m CTD
1832 End S2C5
1844 Transit to recover PP array
1901 Begin PP array recovery: 22°46.465 N, 158°08.095 W
1947 PP array recovered, transit back to ALOHA
2020 S2C6 1000m CTD
2145 End S2C6
2153 Start Net Tow (Caron)
2215 End Net Tow (Caron)
2217 Net tow
2234 Net tow end
2347 S2C7 1000m CTD

February 26, 2018

0015 End S2C7
0030 Transit to pump tanks
0150 S2C8 1000m CTD
0302 End S2C8
0448 S2C9 1000m CTD
0604 End S2C9
0615 Start Net Tow (Caron)

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0647 End Net Tow (Caron)
0756 S2C10 1000m CTD
0912 End S2C10
0915 Transit to pump tanks
1035 Deploy ATE
1043 Start Net Tow (Caron)
1100 Recover ATE
1105 End Net Tow (Caron)
1115 S2C11 1000m CTD
1230 End S2C11
1247 Net tow
1316 Net tow end
1321 Net tow
1348 Net tow end
1356 S2C12 1000m CTD
1515 End S2C12
1530 Start Net Tow (Caron)
1602 End Net Tow (Caron)
1643 S2C13 1000m CTD
1759 End S2C13
1802 Transit to pump tanks
1955 S2C14 1000m CTD
2121 End S2C14
2231 S2C15 near bottom CTD
2242 Recover S2C15, caps left on, pinger left off
2252 Re-deploy S2C15 near bottom CTD
2332 Captain's call to abort the cast at 525db, due to unsafe conditions, wire snaps and tension drops.

February 27, 2018

0000 End S2C15, no bottles fired
0015 Transit to Station 52, WHOTS-14 buoy
0125 Arrive WHOTS-14 buoy, NW of mooring
0856 S52C1 200m Yo-Yo, 200m CTD
1111 End S52C1, 5 cycles complete
1220 Start Net Tow (Caron)
1248 End Net Tow (Caron)
1327 WHOTS Buoy Inspection
1328 Transit to Kaena

February 28, 2018

0806 Arrive at Pier 35.

HOT program sub-components:

Investigator	Project	Institution
Dave Karl	Core Biogeochemistry	UH
John Dore	Biogeochemistry QA/QC	MSU
Roger Lukas	Hydrography	UH
Mike Landry	Zooplankton dynamics	SIO
Ricardo Letelier	Optical measurements	OSU
Ancillary programs:		
Andrew Dickson	CO ₂ dynamics and intercalibration	SIO
Paul Quay	DI ¹³ C	UW
Matthew McCarthy Tom Guilderson	Sediment trap samples to look at amino acid-based paleo proxies to examine propagation of exported production into coral polyps and skeletons.	UCSC
Matt Church	Diversity and activities of nitrogen-fixing microorganisms	UM/FLBS
Sam Wilson	Reduced gases in the upper ocean: The cycling of methane, sulfide and nitrous oxide.	UH
Sara Ferrón-Smith	Determination of gross primary production from the euphotic zone in situ, using the drifting primary production array	UH
Dave Caron	SCOPE: Protistan biodiversity, tropic activities, culturing	USC
Ed DeLong	SCOPE: DNA and Viral DNA collection, Single cell genomic flow cytometry sample collection	UH
Dan Repeta	SCOPE: DOM collection	WHOI
Angelique White	SCOPE: Diazotroph Microscopy, C-STAR, IFCB and LISST to record nano-plankton special diversity	OSU
William Miller	DIC Photo-production	UGA
Grieg Steward	Three dimensional model system of mixotrophic Phytoplankton, its prey and a giant virus infecting them	UH
Dave Karl	Mixing Experiment	UH
Karin Bjorkman & Sara Ferrón-Smith	Comparison of ¹⁴ C-assimilation and gross O ₂ production, and effects on respiration at different light intensities.	UH